



# Hydrogen Leak Detection Sensor Database

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# Outline

- Background information
- Overview of database details
- Database Snapshot
- Sensor types
- Examples
- Technology use
- Acknowledgements



# Background Information

- NASA remains interested in improving its ability to detect and assess hydrogen gas leaks in its space applications
- MSFC/EV43 looks to support the Technology Evaluation for Environmental Risk Mitigation (TEERM) activities
  - Surveyed existing hydrogen leak detection sensors
  - Received input from other NASA centers:
    - Glenn Research Center (GRC)
    - Kennedy Space Center (KSC)
    - White Sands Test Facility (WSTF)



# Overview

- Hydrogen Leak Detection Database Specifics
  - Manufacturer
  - Sensor specification sheet
  - Target gas (hydrogen)
  - Concentration range (ppm or % of lower flammable limit)
  - Operating temperature
  - Dimensions
  - Weight
  - Manufacturer website
  - Technology use
  - General notes about the sensor



# Database Snapshot

#	Manufacturer	Sensor/Detector Specification Sheet	Target Gas	Concentration Range	Operation Temperature Range (°C)	Dimensions
1	AppliedSensor Inc	<a href="#">HLS-440</a>	Hydrogen (H2)	0 - 44,000 ppm; 0 - 4.4 % H2 in air	-40 -> +110 °C	82.2 x 42 x 17.3 mm

#	Manufacturer	Weight	Website	Technology Use	Notes
1	AppliedSensor Inc	50 g	<a href="http://www.appliedsensor.com/">http://www.appliedsensor.com/</a>	H2 Storage/Fueling Facility; Test Area	The HLS-440 Hydrogen Leak Sensor incorporates a heated field-effect transistor with a catalytic metal gate stack as the gas-sensing layer.



# Sensor Types

- Microelectromechanical Systems (MEMS)
- Dye
- Electrochemical
- Catalytic

#	H2 Detection Approach	Mass (g)	Power (mW)	Sensitivity (ppm)	Accuracy at 2 % (%)	Inert/Cryogenic Operation	Response Time (s)
1	H2 MEMS	72	300	10	< 2	Yes	< 1
2	Dye	370	4000	15	3	No	60
3	Electrochemical	500	2400	2	0.0001	No	35
4	Catalytic	975	< 1000	15	3	No	< 12



# Sensor Type Examples

- Microelectromechanical Systems (MEMS) Device
  - [GRC/Makel Engineering Sensor Unit](#)
  - Kebaili Corporation – KHS-200 MEMS Micro-Pellistor Hydrogen Sensor
- Dye
  - [Element One Chemochromic Sensing Material](#)
- Electrochemical
  - Air Test Technologies – [TR3200 Electrochemical Gas Sensor](#)
  - Honeywell – Hydrogen Sensor Switch
  - Sensidyne, LP – Part No. 101236-D-1 H2 Sensor
- Catalytic
  - AppliedSensor Inc – [HLS-440](#)
  - Neodym Technologies Inc – ProtiSen - Catalytic Hydrogen Gas Sensor
  - US Industrial Products Co., Inc. – USI Catalytic H2 Sensor Model 7100



# Technology Use

- Currently, there are 65 hydrogen leak detection sensors in the database.
- An attempt was made to determine the potential uses for each sensor.
  - Ground (Storage/Fueling Facility or Test Area)
  - Vehicle
- Most were determined to be used for ground purposes only.



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